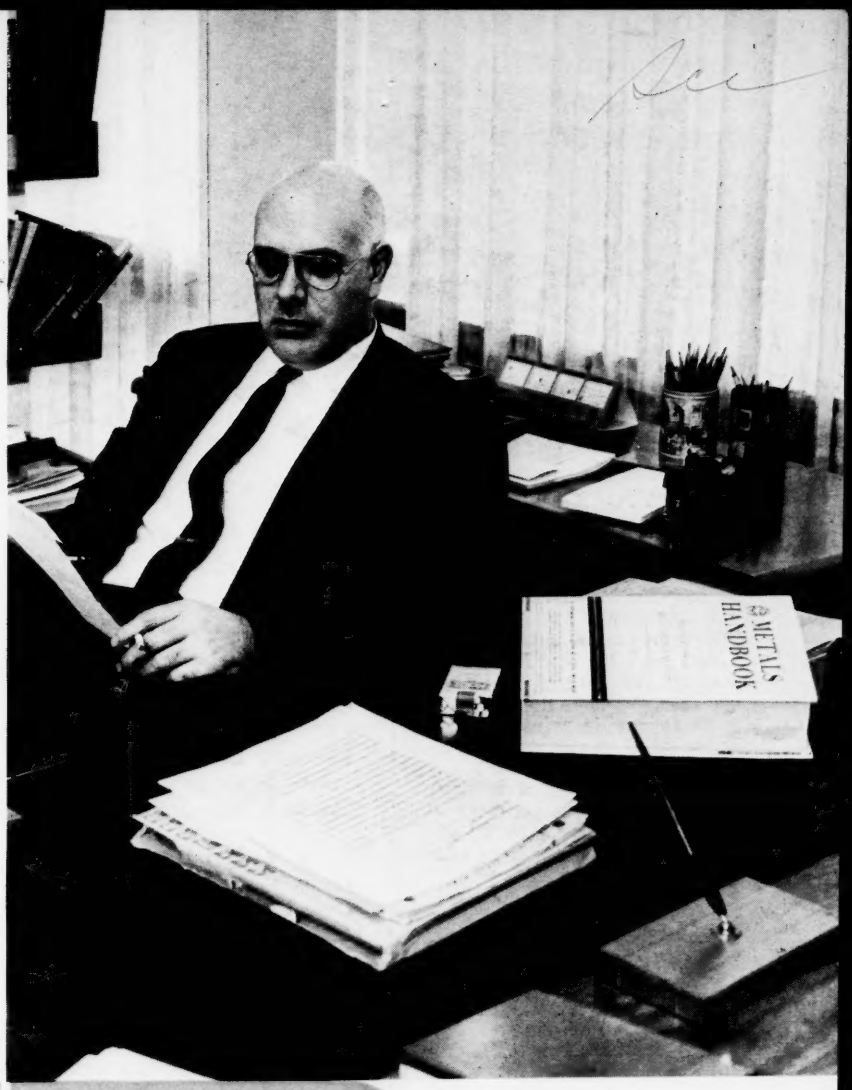
LOS ANGELES PUBLIC LIBRARY

AUG 1 7 1961

Taylor Lyman, Editor
ASM Metals Handbook

See

The 3-Minute Glass
Page 22



August, 1961

STACKS

METALS REVIEW

The News Digest Magazine

LOS ANGELES PUB LIB
ATT SERIALS DIV
630 W FIFTH ST
LOS ANGELES 17 CAL 513E

The 16th METALLOGRAPHIC EXHIBIT

Detroit, October 23 to 27, 1961

All metallographers—
everywhere—
are cordially invited to
display their best work.

RULES FOR ENTRANTS

Exhibitors do not need to be members of the American Society for Metals.

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable.

Photographic prints should be mounted on stiff cardboard, extending no more than 3 in. beyond edge of print in any direction; maximum dimensions 14 by 18 in. (35 by 45 cm.). Heavy, solid frames are unacceptable.

Entries should carry a label on the *face of the mount* giving:

Classification of entry.

Material, etchant, magnification and other desirable data.

A brief statement (if desired) calling attention to any unusual aspect of the entry.

The name, company affiliation and postal address of the exhibitor should be placed on the *back of the mount* together with a request for return of the exhibit if so desired.

Entrants living outside the United States should send their micros by first-class letter mail endorsed "Photo for Exhibition — No Commercial Value — May Be Opened for Customs Inspection".

Exhibits must be delivered before Oct. 10, 1961, either by prepaid express, registered parcel post or first-class letter mail, addressed:

Metallographic Exhibit
American Society for Metals
Metals Park
Novelty, Ohio, U. S. A.

CLASSIFICATION OF MICROS

Class 1. Irons and steels, cast and wrought
Class 2. Stainless steels and heat resisting alloys
Class 3. Aluminum, magnesium, beryllium, titanium and their alloys
Class 4. Copper, nickel, zinc, lead and their alloys
Class 5. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements
Class 6. Metals and alloys not otherwise classified
Class 7. Series showing transitions or changes during processing
Class 8. Welds and other joining methods
Class 9. Surface coatings and surface phenomena
Class 10. Slags, inclusions, refractories, cermets and aggregates
Class 11. Electron micrographs using replicas
Class 12. Electron micrographs (transmission)
Class 13. Color prints in any of the above classes
Class 14. Results by unconventional technique

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which in the opinion of the judges closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $500 from the Adolph I. Buehler Endowment will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters.

All prize-winning photographs will be retained by the Society for one year and placed in a traveling exhibit to the various Chapters.

43rd NATIONAL METAL CONGRESS & EXPOSITION

Cobo Hall, Detroit——————————Oct. 23 to 27, 1961

August, 1961 Vol. XXXIV, No. 8

METALS REVIEW

The News Digest Magazine

T. C. DuMond
Editor

Betty A. Bryan
Managing Editor

Fred L. Siegrist
James C. Nelson
Associate Editors

A. P. Ford
Director of Communications

Fred Stanley
Advertising Manager

G. H. Loughner
Production Manager

ADVERTISING OFFICES

Rodney W. Cramer
Metals Park, Novelty, Ohio
EDgewood 8-5151

John B. Verrier, Jr.
David Brooks
Ronald E. Maver
342 Madison Ave., Room 1228
New York 17, N.Y.
OXford 7-9027

David A. Lewis
P.O. Box 9740
Pittsburgh 29, Pa.
WEllington 1-2123

Donald J. Walter
20050 Livernois St.
Detroit 21, Mich.
UNiversity 4-3861

Ronald L. Rose
Robert Whaley
(Whaley-Simpson Co.)
6608 Selma Ave.
Los Angeles 28, Calif.
HOllywood 3-7157

Gordon Simpson
(Whaley-Simpson Co.)
700 Montgomery St.
San Francisco 11, Calif.
SUtter 1-4583

Contents

ASM Chapter Officers, 1961-1962 5
Notice of Proposed Constitution Additions 14
Milwaukee Seminar on Crystalline Imperfections 16
Dayton Chapter Educational Series on Research Methods 19

Important Chapter Lectures

Nondestructive Testing of Steel, by W. A. Black 16
Quality Control in the Manufacture of Thin-Wall Rocket Motor Cases, by Dean K. Hanink 16
Steelmaking Processes, by Frederick C. Langenberg 17

Chapters in Print

Chicago 16
Dayton 19
Eastern New York 15
Milwaukee 16
Penn State 17
St. Louis 15
Warren 16
Worcester 15

Departments

Editor's Page 4
3-Minute Glass 22
Employment Service Bureau 20

Published monthly at 404 N. Wesley Ave., Mount Morris, Ill., by the American Society for Metals. Editorial and general offices Metals Park, Novelty, Ohio: W. A. Pennington, President; C. E. Swartz, Vice-president; R. J. Raudebaugh, Treasurer; Merrill A. Scheil, Secretary; C. H. Samans, A. R. Fairchild, Morris Cohen and John Convey, Trustees; Walter Crafts, Past President; Allan Ray Putnam, Managing Director. Subscriptions, $3.00 per year ($7.50 foreign). Single copies $1.50. Second class postage paid at Mount Morris, Ill. and at additional mailing offices.
Claims for missing numbers will not be allowed if received more than 60 days from date of issue. No claims allowed from subscribers from overseas, or because of failure to notify the circulation department of a change of address or because copy is "missing from files".

Copyright © 1961 by the American Society for Metals

THE EDITOR'S PAGE

By way of report, we would like to inform you that your Society now has a membership exceeding 34,000. The new record high figure —actually it was 34,015 — was reached on June 30 of this year. A comparison shows that we now have 3095 more members than on Jan. 1, 1960. Perhaps you are interested in further data showing ASM's growth. Here goes: Jan. 1, 1920, showed 1824 members; the same date in 1930 recorded a total of 5944; 1940 almost doubled the last decade figure with 10,983; from then until 1950 the membership again doubled, reaching 20,600. By 1960 we had grown to 30,920. These growth figures prove two things, we believe. First, the stature and importance of metals, metals engineering and metalworking have increased tremendously. Second, the educational activities of ASM on both national and local levels are attracting technical people at all levels in all industries faced with the problem of better metals utilization.

Cooperation

Typical of attempts to serve the needs of metalworking in a specific area is the joint program being developed by the Puget Sound (Seattle) Chapter ASM, the American Welding Society and the Society for Nondestructive Testing. Next year, from June 7 through 9, during Seattle's "Century 21 Exposition" the three groups will stage a Pacific Northwest Metals Conference. Its theme is "Metals Technology—Key to Century 21." Each group will attack its specific phase of a problem. ASM will cover metals selection and properties; AWS will provide information on joining these specific metals; SNT will tell how to test the resulting structures. Further information can be obtained from R. E. Holt, Mechanical Engineering Dept., University of Washington, Seattle 5, Wash.

Words

After years of close association with words, an individual is likely to develop definite antipathies for some words and phrases. I have some and, despite the obvious hazards of pointing out grammatical errors, will venture to expose some of my favorite fetishes. Here are a few: the use of "render" for "make"; "since" for "because"; "while" for "although"; "employ" for "use"; "quite" for "rather"; and complete overwork of a simple three-letter word—"the". What is the hazard? Probably some abler grammarian will find too many errors on this page.

Example

Speaking of words, in earlier editorial experiences it was learned how consternation can be caused by a poor word selection. A fellow editor was writing a caption to explain a graphic representation of the comparative fatigue life of two metals. After explaining the tests to which both metals were subjected, the writer stated: "After two million cycles the specimen on the left was still serviceable and the other specimen was utterly fatigued". It did not take long for one agitated reader to write, saying "Don't you mean too, too utterly fatigued?"

T. C. DuMond

ASM Members—Admission to the National Metal Congress and Exposition is by your ASM Membership Card or $2.00. Don't forget your membership card!

New!

HIGH-STRENGTH STEELS FOR THE MISSILE INDUSTRY

Materials and fabrication problems, stress corrosion, fracture toughness, metallurgical tests—all these idea-filled subjects and more are covered in this new, authoritative ASM book. Authors from Aerojet-General, United States Steel, U. S. Naval Research Laboratory, General Motors, NASA, Mellon Institute for Industrial Research, United Aircraft and National Academy of Sciences make this an essential book for your use now—and for your reference library.

284 p.
8½ × 11
hard cover

ASM Members $9.60
Non-members $12.00

Mail to—
American Society for Metals
Metals Park, Novelty, Ohio

Send *High-Strength Steels for the Missile Industry*

☐ Bill Me $9.60 as ASM Member
☐ Check or Money Order Enclosed
☐ $12.00 Non-Member

NAME_____
COMPANY_____
STREET_____
CITY_____

CHAPTER OFFICERS, 1961-62

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
AKRON	Charles L. Durell 195 25th St., N.W. Barberton, Ohio	R. E. Crassweller 1484 Ridpath Ave. Akron 13, Ohio	Fred B. Snyder 129 Hall Dr. Wadsworth, Ohio	Michael Kozak 1463 Ries St. Barberton, Ohio
ALBERTA	V. J. Campbell 2404 1st Ave., N.W. Calgary, Alba., Canada	J. T. Whitfield 1436 Remington Rd. Calgary, Alba., Canada	J. E. Crowe 3115 Kilkenny Rd. Calgary, Alba., Canada	
ALBUQUERQUE	Lewis P. Wilson 424 Wellesley Dr., S.E. Albuquerque, N.M.	Vernon L. Gilmore 1320 Silver, S.E. Albuquerque, N. Mex.	Donald R. Adolphson 1305 Arizona St., N.E. Albuquerque, N. Mex.	
ATLANTA	George A. Barker, Jr. 4094 Statewood Rd., N.E. Atlanta 5, Ga.	John H. Camp P.O. Box 5227 Station E Atlanta 7, Ga.	Forrest B. Yarborough 128 Herrin Dr. Smyrna, Ga.	Jeffrey T. Walkden Atlantic Steel Co. Warehouse Div. P.O. Box 1714 Atlanta 1, Ga.
BALTIMORE	G. M. Hinton Baltimore Gas & Electric Lexington & Liberty Baltimore 3, Md.	John S. White Armco Steel 901 Fairway Dr. Towson 4, Md.	John A. McKay Crucible Steel Co. 6021 Mannington Ave. Baltimore 6, Md.	
BEAVER VALLEY	N. L. Steinacker 958 7th Ave. Beaver, Pa.	S. Prisuta 1121 Atlantic Ave. Monaca, Pa.	I. A. Bonzo R.F.D. 2, Box 95 New Brighton, Pa.	C. Church 2904 20th St. Ext. Beaver Falls, Pa.
BIRMINGHAM	Edward G. Balog 2932 Fairway Dr. Birmingham 13, Ala.	C. B. Reymann 220 Stacey Cir. Birmingham, Ala.	E. H. Phelps 513 Yorkshire Dr. Birmingham, Ala.	
BONNEVILLE	James A. Bryson Thiokol Chemical Corp. Tremonton, Utah	Jesse A. West Marquardt Corp. Ogden, Utah	Clyde E. Reed Marquardt Corp. Ogden, Utah	Howard H. McIntosh Thiokol Chemical Corp. Tremonton, Utah
BOSTON	Harrison I. Dixon Metallurgical Products Brookline, Mass.	Steven G. Demirjian General Electric Co. Lynn, Mass.	John D. Paine, Jr. United Shoe Machinery Corp. Beverly, Mass.	
BRITISH COLUMBIA	John Billings 7422 Imperial St. Burnaby, B.C., Canada	J. A. Millcarch 757 W. 61st Ave. Vancouver 14, B.C., Canada	John A. Lund 1743 W. 68th Ave. Vancouver 14, B.C., Canada	John Morfitt Gearmatic Co., Ltd. 7400 132nd St. North Surrey, B.C., Canada
BUFFALO	Maurice A. Grobe Chevrolet-Tonawanda P. O. Station B Buffalo 7, N.Y.	David H. Mackey Simonds Saw & Steel Box 157 Lockport, N.Y.	Emil M. Galbreath Hobart Welder Sales & Service 107 Botsford Place Buffalo 16, N.Y.	John W. Rickey Bethlehem Steel Co. 102 Newton Rd. Hamburg, N.Y.
BUFFALO-ERIE COUNTY TECHNICAL GROUP	Raymond Skain c/o John McIntyre Erie Co. Tech. Institute Williamsville, N.Y.	Ronald Totaro c/o John McIntyre Erie Co. Tech. Institute Williamsville, N.Y.	Dennis Shirback c/o John McIntyre Erie Co. Tech. Institute Williamsville, N.Y.	Michael Robbins c/o John McIntyre Erie Co. Tech. Institute Williamsville, N.Y.
CALUMET	G. L. Armstrong R.R. 1, Box 28 Schererville, Ind.	J. B. Moore N.I.P.S. Co. 5265 Hohman Ave. Hammond, Ind.	W. R. Murphy Youngstown Sheet & Tube Riley & Dickey Rd. E. Chicago, Ind.	J. W. Luoma Blaw-Knox Co. P.O. Box 299 E. Chicago, Ind.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
CANTON-MASSILLON	J. A. Rinebolt Republic Steel Co. Research Lab. 8th St., N.E. Canton, Ohio	C. F. Jatczak Physical Metallurgy Res. Timken Roller Bearing Co. Steel and Tube Div. Canton 6, Ohio	R. A. Bloom Process Metallugy Res. Timken Roller Bearing Co. Steel and Tube Div. Canton 6, Ohio	G. T. Piper Hoover Co. North Canton, Ohio
CAROLINAS CENTRAL	Peter R. Kosting Army Research Office Box CM, Duke Station Durham, N.C.	Charles H. Tuttle Roberts Co. Sanford, N.C.	Larry E. Poteat N.C. State College Dept. of Mineral Industries Raleigh, N.C.	Franz Weddeling Army Research Office Box CM, Duke Station Durham, N.C.
CAROLINAS NORTHERN PIEDMONT	Tom E. Gregory Western Electric Winston-Salem, N.C.	C. L. Saunders Crotts and Saunders Winston-Salem, N.C.	O. J. Fischer Western Electric Winston-Salem, N.C.	C. G. Janis Western Electric Winston-Salem, N.C.
CAROLINAS SOUTHERN PIEDMONT	James D. Nisbet Allvac Metals Co. Monroe, N.C.	R. N. Hooker Douglas Aircraft Charlotte, N.C.	J. W. Schout Tool Service Engineering Monroe, N.C.	J. Katz Douglas Aircraft Monroe, N.C.
CEDAR RAPIDS	Robert E. Thune 4061 Dalewood Ave., S.E. Cedar Rapids, Iowa	Charles A. Brolin 1100 30th St., S.E. Cedar Rapids, Iowa	Leonard N. Feurhelm 1544 6th Ave., S.E. Cedar Rapids, Iowa	
CENTRAL ONTARIO	Clarence Beingessner B & W Heat Treating P.O. Box 544 Kitchener, Ont., Canada	Garth Johnson Canadian Blower & Forge Co., Ltd.. Kitchener, Ont., Canada	Willar Lauber 45 Cherry St. Kitchener, Ont., Canada	John A. O'Donoghue 480 Edna St. Kitchener, Ont., Canada
CHATTANOOGA	William E. Few 4520 Murray Hills Dr. Chattanooga 6, Tenn.	E. L. Cook Industrial Metals Testing 600 E. 10th St. Chattanooga 3, Tenn.	John H. McMinn 306 N. St. Marks Chattanooga 11, Tenn.	Paul Haughton Combustion Engineering Inc. 911 W. Main Chattanooga, Tenn.
CHICAGO	V. R. Scott Acme Steel Co. Riverdale Station Chicago 27, Ill.	E. J. Pavesic Lindberg Steel Treating 1975 N. Ruby St. Melrose Park, Ill.	W. L. Meinhart Crane Co. 4100 S. Kedzie Ave. Chicago 32, Ill.	Robert Dallman Robert W. Hunt Co. 810 S. Clinton St. Chicago 7, Ill.
CHICAGO-NORTHWESTERN TECHNOLOGICAL INSTITUTE GROUP	Richard J. Higgins Materials Science Dept. Northwestern Technological Institute Evanston, Ill.	Orville F. Kimball Materials Science Dept. Northwestern Technological Institute Evanston, Ill.	Orville F. Kimball Materials Science Dept. Northwestern Technological Institute Evanston, Ill.	
CHICAGO-WESTERN	Oliver S. Spark 545 N. Grove Ave. Oak Park, Ill.	Herbert F. Krohn Bethlehem Steel Co. Prudential Plaza Chicago 1, Ill.	Arthur F. Lukowicz Sunbeam Corp. 5600 W. Roosevelt Rd. Chicago 50, Ill.	
CINCINNATI	William P. Koster 5840 Cherokee Dr. Cincinnati 43, Ohio	Robert C. Downey 775 Chipley Ct. Cincinnati 40, Ohio	R. A. Baughman 8969 Fountainbleau Cincinnati 31, Ohio	R. E. Bader 7148 Garden Rd. Cincinnati 36, Ohio
CLEVELAND	Robert M. Baker Cleveland Diesel Engine Div. GMC 2160 W. 106th St. Cleveland 11, Ohio	John M. Fox Aluminum Co. of America 2210 Harvard Ave. Cleveland 5, Ohio	Robert T. Hook Warner & Swasey Co. 5701 Carnegie Ave. Cleveland 3, Ohio	James L. Holley General Electric Co. 4966 Woodland Ave. Cleveland 4, Ohio
COLUMBIA	Walter F. Howering 2007 Melissa Lane Columbia, S.C.	Robert Honeyman 4710 Oakwood Rd. Columbia, S.C.	Royce G. Waites 6211 Satchelford Rd. Columbia, S.C.	H. O. Brown 110 Summerlea Dr. Columbia, S. C.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
COLUMBIA BASIN	Thomas W. Evans 1835 Jay St. Pasco, Wash.	S. H. Bush 630 Cedar Richland, Wash.	E. A. Evans 1313 Cedar Richland, Wash.	L. A. Hartcorn 629 Birch Ave. Richland, Wash.
COLUMBUS	E. M. Sherwood Battelle Memorial Institute 505 King Ave. Columbus 1, Ohio	Samuel H. Ziegler Westinghouse Electric 300 Philipi Rd. Columbus, Ohio	R. E. Christin Electric Heat Treating Co. 2132 Eakin Rd. Columbus 16, Ohio	C. G. Fosnaught Williams & Co., Inc. 900 Williams Rd. Columbus, Ohio
DAYTON	William D. Walther 432 Canterbury Dr. Dayton 29, Ohio	Attwell M. Adair 451 Renoir Place Dayton 31, Ohio	Harry D. Henkel 316 Peach Orchard Dayton 19, Ohio	Franklin E. Merica 421 Margaret Dr. Fairborn, Ohio
DELAWARE VALLEY	J. O. Mack U. S. Steel Corp. Fairless Works Fairless Hills, Pa.	A. Merlin Smith Rockwell Mfg. Co. Hopewell, N.J.	Eugene L. Bartolotta U. S. Steel Corp. Fairless Works Fairless Hills, Pa.	John A. McDowall John A. Roeblings Sons S. Broad St. Trenton, N.J.
DES MOINES	R. W. Breckenridge Mechanical Engineering Dept. Iowa State University Ames, Iowa	Charles V. Owen, Jr. Metals Development Bldg. Ames Laboratory Iowa State University	M. L. Patzig, Jr. Patzig Testing Laboratories 2215 Ingersoll Ave. Des Moines 12, Iowa	
DETROIT	Robert B. Boswell Chrysler Corp. P.O. Box 1919 Birmingham, Mich.	Frederick P. Bens Climax Molybdenum 624 Fisher Bldg. Detroit 2, Mich.	Jack LaBelle Detroit Diesel Engine Div. GMC 217 Westwood Rd. Birmingham, Mich.	
EASTERN NEW YORK	D. L. Wood Research Laboratory General Electric Co. Schenectady, N.Y.	R. P. DeVries Allegheny Ludlum Steel Watervliet, N.Y.	W. G. Fabofsky General Electric Co. Bldg. 273-247 Schenectady, N.Y.	J. J. McCarthy Dept. of Metallurgical Engineering Rensselaer Polytechnic Institute Troy, N.Y.
EDMONTON	Albert Hanson Hanson-Parr Engineering Box 4295 Edmonton, Alba., Canada	John N. Howell 11630 77th Ave. Edmonton, Alba., Canada	F. Richard Clift P.O. Box 400 Edmonton, Alba., Canada	George Harcus 9747 86th Ave. Edmonton, Alba., Canada
FORT WAYNE	Norman L. McClymonds 234 E. Maple Grove Ft. Wayne, Ind.	Floyd I. Steffens R.R. 2 Grabill, Ind.	Beresford N. Clarke 2245 Muscoday Pass Ft. Wayne, Ind.	Robert H. Witchey 935 Morrow Way Dr. Ft. Wayne, Ind.
GOLDEN GATE	John Schuyten Vulcan Foundry 4401 San Leandro St. Oakland 1, Calif.	Eugene H. Edwards Standard Oil Co. (Calif.) Richmond, Calif.	N. W. McLeod Tube Forgings Co. 1605 Solano Ave. Berkeley, Calif.	Frederick R. Sullivan Caterpillar Tractor Co. 800 Davis St. San Leandro, Calif.
HARTFORD	Henry Hubbell Fafnir Bearing Co. New Britain, Conn.	William R. Johnson Associated Spring Corp. Bristol, Conn.	Thomas P. Hanford The Stanley Works New Britain, Conn.	Dudley W. Rockwell Stanley P. Rockwell Co. Hartford, Conn.
INDIANAPOLIS	Dean K. Hanink Allison Div., GMC P.O. Box 894, Plant 8 Indianapolis, Ind.	Peter C. Murphy P. R. Mallory & Co. P.O. Box 1582 Indianapolis, Ind.	Vito V. Mitkus Diamond Chain Co., Inc. 402 Kentucky Ave. Indianapolis, Ind.	John Mitchell 902 Belmar Ave. Indianapolis, Ind.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
INLAND EMPIRE	George J. Binczewski E. 13920 4th St. Spokane 66, Wash.	Ernest A. Sprow E. 10703 27th Ave. Spokane, Wash.	Joe W. Cavender 4211 N. Post St. Spokane 18, Wash.	
JACKSON	Howard Womochel Michigan State University East Lansing, Mich.	Thomas Clark Fab Alloy Co. Jackson, Mich.	W. R. Casselman Kelsey-Hayes Co. Jackson, Mich.	Virgil Knierim Aeroquip Corp. Jackson, Mich.
KANSAS CITY	C. G. Hummon Sheffield Div. Armco Steel Corp. Kansas City 3, Mo.	Henry P. DeWitt 2731 Campbell Kansas City, Mo.	Edward H. Stahl 444 W. Dartmouth Kansas City 13, Mo.	E. E. Bagby 2400 W. 75th Place Kansas City 13, Mo.
LEHIGH VALLEY	Robert H. Holloway 921 Magnolia Rd. Hellertown, Pa.	George P. Conard II 445 High St. Bethlehem, Pa.	Bernard J. Fischer 1526 Lebanon St. Bethlehem, Pa.	Halfred C. Smith M.R. 27 Bethlehem, Pa.
LONG ISLAND	James L. Curtis 50 Webb Ave. Hempstead, N.Y.	John R. Weeks Acorn & Elm Lanes Stony Brook, N.Y.	James M. Pittman 105 George Rd. N. Bellmore, N.Y.	Stephen A. Montanaro 4 Harmony Court Syosset, N.Y.
LOS ALAMOS	John E. Hockett Box 1663 Los Alamos, N. Mex.	John H. Bender, Jr. 2363B 48th St. Los Alamos, N. Mex.	Philip E. Armstrong 3803A Villa Los Alamos, N. Mex.	
LOS ANGELES	Edward W. Golda 1007 Brockman Bldg. 520 W. 7th St. Los Angeles 14, Calif.	C. H. Dickson 1007 Brockman Bldg. 520 W. 7th St. Los Angeles 14, Calif.	R. E. Huffaker 1007 Brockman Bldg. 520 W. 7th St. Los Angeles 14, Calif.	R. H. Gassner 1007 Brockman Bldg. 520 W. 7th St. Los Angeles 14, Calif.
LOUISVILLE	C. C. Jenkins 1206 Manslick Rd. Louisville 13, Ky.	J. T. Baugher 3330 Radiance Rd. Louisville 15, Ky.	Carl L. Owen 7102 Boxwood Rd. Louisville 7, Ky.	
MAHONING VALLEY	R. Clark Dawes Grove City College Grove City, Pa.	Albert R. Roth, Jr. 136 S. Portland Ave. Youngstown, Ohio	John F. Halase, Jr. 55 Regent St. Campbell, Ohio	
MANITOBA	K. Jarvis 920 Archibald St. Winnipeg 5, Man., Can.	E. J. Klassen 889 Erin St. Winnipeg 10, Man., Canada	G. McIntyre 310 Burnell St. Winnipeg 10, Man., Canada	
MEDICINE HAT	Peter den Hartog 464 7th, N.W. Medicine Hat, Alba., Canada	F. N. Butterfield 478 Connaught Dr. Medicine Hat, Alba., Canada	K. D. Awrey 164 1st St., N.E. Medicine Hat, Alta., Canada	George Bentley Brown 168 4th St., S.W. Medicine Hat, Alba., Canada
MIAMI	Ormand Whipple 5549 N.W. 9th Ave. Ft. Lauderdale, Fla.	Howard Bonebrake 6200 S.W. 85th Ave. Miami, Fla.	Bill Floroplus P.O. Box 665 Dania, Fla.	Francis Komassa P.O. Box 174 Hialeah, Fla.
MICHIGAN COLLEGE OF MINING & TECHNOLOGY	Donald Pokonen Metallurgy Dept. Mich. Col. M & T Houghton, Mich.	Melvin Nietopski Metallurgy Dept. Mich. Col. M & T Houghton, Mich.	Clyde Calhoun Mich. Col. M & T Metallurgy Dept. Houghton, Mich.	Frank Drew Metallurgy Dept. Mich. Col. M & T Houghton, Mich.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
MILWAUKEE	F. V. Horak 5216 W. Washington Blvd. Milwaukee 8, Wis.	C. K. David Ladish Co. 4452 S. Burrell St. Milwaukee 7, Wis.	Ernest G. Guenther 3336 N. Downer Ave. Milwaukee 11, Wis.	
MINNESOTA	C. Fred Quest Shakopee Foundry Co. Shumay & 3rd Shakopee, Minn.	Chester A. Engquist Boker's Inc. 3104 Snelling Ave. Minneapolis, Minn.	Lillian K. Polzin 302 Wesley Temple Bldg. Minneapolis 3, Minn.	
MOHAWK VALLEY	John F. Mullin 911 York St. Utica 4, N.Y.	F. Keith Younger 643 Glendale Place Utica, N.Y.	John G. Ziemann 1462 Herkimer Rd. Utica, N.Y.	Edward F. O'Mara 142 Wager Dr. Rome, N.Y.
MONTREAL	A. Scully P. O. Box 1238 Place d'Armes Montreal, P.Q. 1, Can.	R. H. Peck P. O. Box 460 Montreal, P.Q., Can.	S. D. Entwistle 278 Bellevue Dr. Pincourt Ile Perrot, P.Q., Can.	
MUNCIE	Charles R. Jones 604 High School Rd. Rushville, Ind.	William J. Evans 332 Parkview Dr. New Castle, Ind.	Richard P. Edwards 1106 E. Seymour St. Muncie, Ind.	
NEW HAMPSHIRE	James A. Collins 195 Central Ave. Dover, N.H.	Oliver Johnson Bay View Rd. Saco, Me.	H. Bradford Wylie 84 Silver St. Dover, N.H.	
NEW HAVEN	Roy C. Raymond 355 Wilbar Dr. Stratford, Conn.	Delmar E. Trout 152 Lydale Place Meriden, Conn.	John M. Quinn 24 General Patton Dr. Naugatuck, Conn.	Clinton E. Swift Connecticut Welders S. Colony Rd., Box 306 Wallingford, Conn.
NEW JERSEY	Milton Margolis 136 Franklin St. Cedar Grove, N.J.	Oscar O. Miller International Nickel Co. 67 Wall St. New York, N.Y.	R. B. Christofferson, Jr. 46 Marion Rd. Verona, N.J.	Richard W. Thorne 246 Raymond Blvd. Newark 5, N.J.
NEW ORLEANS	James F. Shay P. O. Box 10008 Jefferson Branch New Orleans 21, La.	Donald D. Williams 70 Oaklawn Dr. Metairie, La.	Glenn M. Woodward 4738 Plauche Circle New Orleans 26, La.	
NEW YORK	Harold Margolin New York University University Hgts. New York 53, N.Y.	David W. McDowell International Nickel 67 Wall St. New York 5, N.Y.	Sidney H. Avner New York City Community College 300 Pearl St. Brooklyn 1, N.Y.	Oliver E. Olsen National Lead Co. 105 York St. Brooklyn 1, N.Y.
NEW YORK POLYTECHNICAL INSTITUTE OF BROOKLYN GROUP	Thomas O. Montelbano 517 60th Brooklyn 9, N.Y.	Michael Snyderman 441 Ocean Parkway Brooklyn 18, N.Y.	Raymond Scheurer	Leonard Bonacorsa
NEW YORK UNIVERSITY GROUP	Robert D. Geller 211-10 73rd Ave. Bayside 64, N.Y.	Sheldon R. Simon Gould Hall Dorm New York University Bronx 53, N.Y.	Bernard Siegel 239 Legion St. Brooklyn 12, N.Y.	Sanford Adler 85 N. Broadway Yonkers, N.Y.
NORTHEAST PENNSYLVANIA	T. J. Duddy 200 E. 13th St. Berwick, Pa.	J. H. Miller 401 Elizabeth St. Towanda, Pa.	N. S. Naugle 900 Sunset Dr. Berwick, Pa.	
NORTH TEXAS	James C. Herr 2801 Leith Ave. Ft. Worth, Tex.	John W. Mitchell 4933 Moss Point Rd. Dallas 32, Tex.	William Boustead 1812 Montclair Dr. Arlington, Tex.	L. H. McCreery 1604 Marshalldale Dr. Arlington, Tex.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
NORTHERN ONTARIO	F. N. Durham Metallurgical Dept. Algoma Steel Corp. Sault Ste. Marie, Ont., Canada	B. W. H. Marsden Steelmaking Dept. Algoma Steel Corp. Sault Ste. Marie, Ont., Canada	H. L. Derrer Soo Foundry and Machine 457 Bay St. Sault Ste. Marie, Ont., Canada	R. H. Baber 961 Wellington St. E. Sault Ste. Marie, Ont., Canada
NORTHWESTERN PENNSYLVANIA	L. R. Maitland 1007 2nd St. Meadville, Pa.	William J. Miller Cherry Tree Rd., R.D. 3 Titusville, Pa.	Charles R. Rainesalo 137 Andrews Park Blvd. Erie, Pa.	
NOTRE DAME	Robert F. Wilson Durakool, Inc. 1010 N. Main St. Elkhart, Ind.	Frank Reuwer Sibley Machine & Foundry 206 E. Tutt St. South Bend, Ind.	Charles W. Allen 712 N. St. Louis Blvd. South Bend 17, Ind.	Ettore A. Peretti Dept. of Metallurgical Engineering University of Notre Dame Notre Dame, Ind.
OAK RIDGE	David L. McElroy 137 Westover Dr. Knoxville, Tenn.	Allan E. Goldman 117 E. Arrowwood Oak Ridge, Tenn.	James L. Scott 4201 Thornwood Dr. Knoxville, Tenn.	J. H. DeVan 107 Orange Lane Oak Ridge, Tenn.
OLD SOUTH	R. J. Irwin 202 Rock Creek Dr. Greenville, S.C.	Joseph Tyminski 219 Mable Ave. Greenville, S.C.	Bill Robson Overbrook Dr. Greer, S.C.	Gerald P. Rosenberg 25 Lullwater Rd. Greenville, S.C.
ONTARIO	J. S. Fullerton Handy & Harman of Canada Toronto, Ont., Canada	B. M. Hamilton Atlas Steels Ltd. Welland, Ont., Canada	C. H. Ironberg 56 Pinehurst Dr. Hamilton, Ont., Canada	J. E. Shirreff Johnson, Matthey & Mallory Toronto, Ont., Canada
OREGON	William H. Rice Esco Corp. 2141 N.W. 25th Portland 10, Ore.	Olaf G. Paasche Dept. of Mechanical Engineering Oregon State University Corvallis, Ore.	Curtis L. Graverson Omark Industries, Inc. 5001 S.E. Johnson Creek Blvd. Portland 22, Ore.	
ORLANDO	Alan R. Mortensen 4610 Elaine Place Orlando, Fla.	Morton J. Disckind 2720 Pershing Ave. Orlando, Fla.	Stephen Maszy 7118 Lake Dr. Orlando, Fla.	Charles W. Marshall 4510 Lanmore St. Orlando, Fla.
OTTAWA VALLEY	W. A. Morgan Dept. of Mines & Technical Surveys 568 Booth St. Ottawa, Ont., Canada	H. M. Weld Dept. of Mines & Technical Surveys 568 Booth St. Ottawa, Ont., Canada	C. F. Dixon Dept. of Mines & Technical Surveys 568 Booth St. Ottawa, Ont., Canada	
PENN STATE	John H. Hoke College of Mineral Industries Pennsylvania State University University Park, Pa.	Gerald M. Arey Titan Metal Manufacturing Co. Bellefonte, Pa.	Harold J. Read College of Mineral Industries Pennsylvania State University University Park, Pa.	
PEORIA	Walter H. Lenz 110 Bondurant St. Washington, Ill.	Joseph L. Oberle 928 W. Wilcox Peoria, Ill.	John M. St. John Metallurgy and Materials Eng. Div. Caterpillar Tractor Co. Peoria, Ill.	
PHILADELPHIA	Harry Ghenn American Viscose Corp. Marcus Hook, Pa.	Amos A. Bradd 8107 Hull Dr. Philadelphia 18, Pa.	Matthew G. Fox 218 E. 3rd St. Media, Pa.	George Kaiser Penn Forge Co. Milner & Bleigh Sts. Philadelphia, Pa.
PHOENIX	Merle C. Nutt Arizona State University Tempe, Ariz.	Charles W. Mulkin AiResearch Mfg. Co. 402 S. 36th St. Phoenix, Ariz.	Andrew Wolfe N. 19th Ave. Deer Valley, Ariz.	George Carlton Motorola, Inc. 8201 E. McDowell Rd. Phoenix, Ariz.

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
PITTSBURGH	Robert M. Phillips Aluminum Co. of America New Kensington, Pa.	Norman F. Tisdale, Jr. Metals Purifying Co. Mars, Pa.	Arnold Belkin U.S. Steel Corp. Duquesne, Pa.	Joseph A. Cameron Elliott Co. Jeannette, Pa.
PUEBLO	John M. Mahony P.O. Box 1166 Pueblo, Colo.	John H. Shank 217 Creston Dr. Pueblo, Colo.	R. J. Hopkins 1928 Claremont Pueblo, Colo.	Andrew J. Sabo 23 Oxford Pueblo, Colo.
PUGET SOUND	Mandel Minsk 6029 Oakhurst Rd. Seattle 18, Wash.	J. Fred Baisch 3550 S.W. 171st St. Seattle 66, Wash.	Henry T. Hadley 5001 E. Mercer Way Mercer Island, Wash.	
PURDUE	John S. Sabol R.R. 11 Lafayette, Ind.	Jan M. Hoegfeldt 2320 W. King St. Kokomo, Ind.	R. E. Grace School of Metallurgical Engineering Purdue University Lafayette, Ind.	
QUEBEC	P. J. MacDonald 2080 Blvd. Laurier Quebec 6, P.Q., Canada	Maurice Archambault Dept. of Natural Resources Hotel du Gouvernement Quebec, P.Q., Canada	Fernand Claisse Faculte des Sciences Universite Laval Quebec, P.Q., Canada	
RHODE ISLAND	Joseph J. Buchinski Cherry Rd. Wrentham, Mass.	Joseph Gurland Brown University Providence, R.I.	G. H. Schubert Schubert Heat Treating Co. 282 Richmond St. Providence 3, R.I.	
RICHMOND	T. S. Daugherty Reynolds Metals Co. 7724 Cherokee Rd. Richmond 25, Va.	George Ossman, Jr. Southern Stove & Steel 7710 Sweetbriar Rd. Richmond 29, Va.	W. Fortune Smith Reynolds Metals Co. 4th & Canal St. Richmond 19, Va.	S. J. Sansonetti Reynolds Metals Co. 503 Ridgetop Rd. Richmond 29, Va.
ROCHESTER	Robert B. Barrow 840 Wegman Rd. Rochester 11, N.Y.	Robert V. Adair 171 Colebourne Rd. Rochester 9, N.Y.	H. E. Johnson 290 Sunnyside Dr. Rochester 20, N.Y.	
ROCKFORD	Richard C. Stroker 716 Paris Ave. Rockford, Ill.	Joseph F. Sisti 3255 Dartmouth Dr. Rockford, Ill.	Wilson Leeming 1228 S. Johnson Rockford, Ill.	Robert L. Snygg 1316 5th Ave. Rockford, Ill.
ROCKY MOUNTAIN	John Golding Gardner-Denver Co. P.O. Box 1020 Denver, Colo.	William M. Mueller Denver Research Institute University of Denver Denver 10, Colo.	Donald T. Klodt Denver Research Institute University of Denver Denver 10, Colo.	Robert L. Whyman Gardner-Denver Co. P.O. Box 1020 Denver, Colo.
ROCKY MT.-COLORADO SCHOOL OF MINES GROUP	Michael Hyatt 19 Prospector Park Golden, Colo.	John Rayno 56 Prospector Park Golden, Colo.	Roger Dumm 505 10th St., Apt. 2 Golden, Colo.	Clinton Eddy 612 24th, Apt. 9 Golden, Colo.
SACRAMENTO VALLEY	Joseph J. Warga Aerojet-General Corp. P. O. Box 1947 Sacramento, Calif.	Frank St. Germain Aerojet-General Corp. P. O. Box 1947 Sacramento, Calif.	Fred Inouye Aerojet-General Corp. P. O. Box 1947 Sacramento, Calif.	Melvin J. Albom Aerojet-General Corp. P. O. Box 1947 Sacramento, Calif.
SAGINAW VALLEY	R. W. Smith 1608 Kensington Flint, Mich.	A. R. Tinetti 3301 Fleming Rd. Flint, Mich.	P. F. George 2905 Manor Dr. Midland, Mich.	

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
ST. LOUIS	John A. Fellows Mallinckrodt Chemical Works P.O. Box 472 St. Charles, Mo.	Leonard B. Gulbransen Dept. of Mechanical Engineering Washington University St. Louis 30, Mo.	A. H. L. Hunnius 6314 Hancock Ave. St. Louis 9, Mo.	
SAN DIEGO	Walter C. Troy 4575 58th St. San Diego 15, Calif.	Gerald W. Langford 5715 Marengo Rd. La Mesa, Calif.	C. W. Haynes 2714 Wyandotte San Diego 17, Calif.	James E. Chafey 5735 Marengo Rd. La Mesa, Calif.
SAN FERNANDO VALLEY	William E. Twiss Twiss Heat Treating 2503 N. Ontario St. Burbank, Calif.	George J. Basl Rocketdyne 6633 Canoga Ave. Canoga Park, Calif.	Chuck Akins Southern California Gas P. O. Box 391 Van Nuys, Calif.	Eugene C. Bernett Jet Propulsion Lab. Cal. Tech. 4800 Oak Grove Dr. Pasadena, Calif.
SANGAMON VALLEY	Joseph Birnbaum 1805 W. Riverview Ave. Decatur, Ill.	Robert W. Bohl 205 Met. Lab. University of Illinois Urbana, Ill.	James E. Rankin 1945 N. 30th Decatur, Ill.	Carl J. Alstetter 217 Transportation Bldg. University of Illinois Urbana, Ill.
SANTA CLARA VALLEY	Oleg D. Sherby 112 Emerson St. Palo Alto, Calif.	A. L. Spencer 10840 Ridgeview San Jose, Calif.	E. S. Wright 10549 Creston Dr. Los Altos, Calif.	Robert N. Johnson 510 Seale Ave. Palo Alto, Calif.
SAVANNAH RIVER	Ronald L. Frontroth 16 Vanderbilt Dr. Aiken, S.C.	George L. Tuer 6 Georgann Lane Aiken, S.C.	David C. Allen 427 Audubon Circle North Augusta, S.C.	Arthur W. Niemer, Jr. 682 Lorraine Dr. North Augusta, S.C.
SOUTHEAST OHIO	A. D. Gate Interlake Iron Corp. Beverly, Ohio	H. R. Grady Vanadium Corp. of America P. O. Box 435 Cambridge, Ohio	S. J. Bragg Vanadium Corp. of America P. O. Box 435 Cambridge, Ohio	R. W. Squibb Armco Steel Corp. Zanesville, Ohio
SOUTHERN TIER	Alan T. Holman 520 Warren Rd. Ithaca, N.Y.	Edward E. Englehard Owego Heat Treating Co. Apalachin, N.Y.	Samuel C. Smith 264 Caldwell Ave. Elmira, N.Y.	
SPRINGFIELD	William Gigowski Chain Belt Co. 369 Plainfield St. Springfield, Mass.	David J. Asquith Moore Drop Forging 38 Walter St. Springfield 7, Mass.	Robert N. Libsch American Bosch Arma Corp. 3664 Main St. Springfield, Mass.	
SYRACUSE	Robert B. Dudley Crucible Steel Co. Sanderson Holcomb Works Syracuse, N.Y.	Thomas F. Davis Peter A. Frasse & Co. Court St. Syracuse, N.Y.	Richard L. Evans Syracuse Heat Treating Burnet Ave. Syracuse, N. Y.	George F. Trojanowski General Electric Co. 3-130 Electronics Park Syracuse, N.Y.
TERRE HAUTE	A. J. Hufschmidt 2930 Fenwood Ave. Terre Haute, Ind.	Thomas R. Jackson P.O. Box 1410 Terre Haute, Ind.	A. H. Luehring 2215 S. 8th St. Terre Haute, Ind.	
TEXAS	LaMar J. Vieau Vieau Engineering 3311 W. Alabama Houston 6, Tex.	Jim Glaze Metals Goods Corp. P. O. Box 1452 Houston, Tex.	Robert M. Shapiro Schlumberger Corp. P.O. Box 2175 Houston, Tex.	
TOLEDO	Robert W. Havens Owens-Illinois Glass Co. 1700 N. Westwood Toledo, Ohio	Raymond F. Lowry Dana Corp.-Spicer Div. 4100 Bennett Toledo 12, Ohio	Herbert T. Anderson Maumee Metal Treating, Inc. Maumee, Ohio	
TRI-CITY	James B. Russell 1752 Hayes Davenport, Iowa	Ralph Moon 6145 Fair Ave. Davenport, Iowa	Robert J. Christ 1126 14th Ave. Moline, Ill.	

CHAPTER	CHAIRMAN	VICE-CHAIRMAN	SECRETARY	TREASURER
TULSA	Dale Davis 2539 E. 23rd Tulsa, Okla.	William R. Bradley 5645 S. Delaware Place Tulsa, Okla.	R. J. Fritts 322 Orchard Dr. Sand Springs, Okla.	
UPPER OHIO VALLEY	L. C. Beale National Steel Corp. Weirton, W. Va.	P. C. Barr Titanium Metals Corp. Toronto, Ohio	R. L. LeVaughan Vanadium Corp. Steubenville, Ohio	Eugene McIntyre Hamilton-Cosco, Inc. Weirton, W. Va.
UTAH	R. E. Kerr Columbia-Geneva Steel P.O. Box 510 Provo, Utah	C. A. Zeldin Kennecott Copper Corp. Utah Refinery Magna, Utah	L. M. Jacobson Columbia-Geneva Steel P. O. Box 510 Provo, Utah	L. D. Scott Columbia-Geneva Steel P.O. Box 510 Provo, Utah
VANCOUVER ISLAND	J. G. Meadley 3015 Dean Ave. Victoria, B.C., Canada	C. A. Waggoner 1224 Reynolds Rd. Victoria, B.C., Canada	C. I. Hinchcliffe 1065 Southgate St. Victoria, B.C., Canada	W. G. McIntosh 3940 Daws Rd. Victoria, B.C., Canada
WARREN	Joseph O. Williams Republic Steel Corp. Pine Ave., S.E. Warren, Ohio	Gordon W. Reeder 381 Glendola St., N. Warren, Ohio	Robert T. MacNaughton Copperweld Steel Co. Warren, Ohio	
WASHINGTON	Harry C. Burnett 4507 Dalton Rd. Chevy Chase 15, Md.	Henry R. Long 1900 Amherst Rd. Hyattsville, Md.	Glenn W. Geil 211 N. Wakefield St. Arlington 3, Va.	Irving J. Feinberg 7308 15th Place Takoma Park, Md.
WEST CENTRAL FLORIDA	William Maxwell Box 245 Dunedin, Fla.	Edward Wohlers 1650 Robinson Dr. St. Petersburg 10, Fla.	Arthur Johnson 4715 Bay Ave. Tampa, Fla.	
WEST MICHIGAN	Claude C. Dierdorf Gardner-Denver Co. Grand Haven, Mich.	C. T. Borden, Jr. Diesel Div.-GMC 2100 Burlingame Grand Rapids, Mich.	Robert A. Harvey Thermo Processing, Inc. 520 32nd St., S.E. Grand Rapids 8, Mich.	
WESTERN ONTARIO	Henry G. Shepherd Border Tool & Die Ltd. 2945 Walker Rd. Windsor, Ont., Canada	Gerald A. Halliday Windsor Tool & Die 1680 Kildare Rd. Windsor, Ont., Canada	Bruce A. McNabb Refractories Engineering 1250 Drouillard Rd. Windsor, Ont., Canada	Andrew Kavosi Auto Specialties Mfg. 614 Tecumseh Rd., E. Windsor, Ont., Canada
WICHITA	Dale A. Zabel 2922 Hiram Wichita, Kan.	Lewis E. Heiney 625 Fairway Wichita, Kan.	William R. Thurtle 5225 Plaza Lane Wichita, Kan.	Marvin A. Oshsner 1716 N. Nevada Wichita, Kan.
WILMINGTON	George E. Dieter, Jr. E. I. du Pont de Nemours Experimental Station Wilmington 98, Del.	Donald Warren 436 Garland Rd. Northwood Wilmington 3, Del.	Andrew Pocolyko E. I. du Pont de Nemours Eastern Laboratories Gibbstown, N. J.	James J. Ma 831 Spruce Ave. West Chester, Pa.
WORCESTER	Francis E. Kennedy 19 Dale St. Rochdale, Mass.	Gordon Rideout 70 Spring St. Shrewsbury, Mass.	Ralph N. S. Merritt, Jr. 3 Winter Hill Dr. Worcester, Mass.	
YORK	M. Jean Rife 21 S. Grant St. Waynesboro, Pa.	Earl J. Hagan 1041 S. Forge Rd. Palmyra, Pa.	Joseph L. Brown 1824 N. Sherman St. York, Pa.	Frank N. Hull 1140 Spring Grove Ave. Lancaster, Pa.

Notice of

Proposed Constitution Additions

As required by the Constitution of the American Society for Metals, notice is hereby given of amendments to be proposed, for membership approval, at the Annual Meeting of the Society at 9:00 a.m., Wednesday, Oct. 25, Cobo Hall, Detroit, Mich. **Additions are shown in boldface.**

ARTICLE V

Fees and Dues

Present Constitution

Amount

Section 1 (a). An initiation fee of $5.00 shall be payable by each applicant for membership as a member or sustaining member. Such fee shall accompany the application, but shall be returned to the applicant if the applicant is not accepted.

(b) Annual membership dues shall be payable as follows:

by each member	$10.00
by each Student Member	2.50
by each Sustaining Member—not less than	25.00

Any member who becomes a Life Member shall thereafter be exempt from payment of dues, if he so requests. Founder Members, Honorary Members and Honorary Life Members shall not be required to pay dues.

(c) Each applicant for reinstatement to membership as a member or sustaining member shall pay a fee of $5.00, which shall accompany the application. If the application is not accepted, the fee shall be returned.

Section 2. All fees and dues shall be paid to the order of the Secretary of the Society. Fees and dues collected from members of a local Chapter may be collected by the local Chapter, but shall be immediately transmitted in full to the Secretary of the Society.

Proposed Additions

Note: Article V Sections 1 a, b, c & Section 2 (as they appear at the left) were approved by the membership at the Annual Meeting of the Society in Philadelphia on Oct. 19, 1960.

Specific provisions for Student Members were not made at that time and, consequently, the following additions (d & e) to Article V, Section 1, are proposed.

(d) A Student Member may apply for membership as a Member and, if accepted, may become a Member without payment of the initiation fee, provided he makes application within six months after the end of the period of his student eligibility.

(e) A Student Member may participate in joint student membership with other Societies under such conditions as may be prescribed by the Board of Trustees.

Merrill A. Scheil

Merrill A. Scheil, *Secretary*
American Society for Metals

MEI Course on Corrosion

The first students to graduate from MEI's newest course, Corrosion, are Walter R. Dickson, associate chemist at the Southern Research Institute, and David Willinger, NASA Lewis Research Center, Plum Brook Reactor Facility, Sandusky, Ohio.

This course, written by Mars G. Fontana, professor at Ohio State University, is already showing considerable evidence of being one of MEI's most popular subjects. During the past month, registrations upped it to third in popularity among the 21 courses now available through the Institute. (The introductory course on Elements of Metallurgy rates first with over 40% of the 4850 enrollments; Heat Treating rates second).

The intensive one-week course recently held in Philadelphia by MEI was extremely well received. A typical comment: "There was a lot more to the course than I had expected".

MEI Director Anton Brasunas is now planning courses to be held in Pittsburgh (Aug. 7-11), Detroit (Aug. 23-30) and Wallingford, Conn. (Sept. 11-15).

Information on the short courses can be obtained by writing to: MEI, American Society for Metals, Metals Park, Ohio.

Mold Control School

By lectures and demonstrations, the new Dietert-Detroit Mold Control Method is being taught, without charge, to all persons interested in the production of high-quality castings made in green and/or dry sand.

This method is based on the principle of processing sand to a predetermined constant moldability or workability so that the sand will ram the same, mold after mold. With a specific degree of moldability and standardized molding energy, a precise and constant mold quality is obtained. This produces castings with minimum size and contour fluctuations.

The Mold Control School teaches this new concept by actual and preparation work and molding in a 2½-day course in Detroit. Classes of 25 will be held the first part of each week during the months of October, November and December, starting every Monday morning.

Write to the Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich., for registration forms.

SHOWN AT A ST. LOUIS MEETING ARE, *from left: John A. Fellows, vice-chairman, Edward M. Flesh, engineering manager, Project Mercury, McDonnell Aircraft Corp., who spoke on "The Challenge of Space"; J. Stanley Skoglund, chairman; and Fred Sanders, assistant project manager, Project Mercury. Mr. Flesh discussed the philosophy of space travel, the planetary system the Mercury operates in, the mechanics of orbital flight and design and operation of the Mercury*

MEETING AT WORCESTER *were Harold J. Holmes, Heald Machine Co., chairman; Herbert D. Berry, Thomas Smith Co., panelist; Gregory J. Shandrick, Lundquist Tool & Manufacturing Co., technical chairman; and Carl Hakanson, Worcester Pressed Steel Co., panelist. The meeting featured a panel on Metal Stampings—Problem Solving Clinic*

STANLEY J. NOESEN, LEFT, FORMERLY METALLURGICAL *engineer at General Electric Research Laboratory, Schenectady, was presented the Alfred H. Geisler Award for 1961 by Sumio Yukawa, chairman of the Eastern New York Chapter, for his contributions to the design of consumable electrode vacuum arc melting furnaces and his contributions in the field of melting of refractory alloys. Mr. Noesen recently transferred to the Lamp Metals and Components Dept., General Electric Co. in Cleveland*

Quality Control in Manufacture of Rocket Motor Cases

The Minuteman Missile Program plays an important part in the defense program of the United States. A very interesting lecture on the metallurgical and quality control requirements for manufacturing the missile rocket motor cases was given by Dean K. Hanink chief metallurgist of the Allison Division, General Motors Corp., at a meeting of the **Chicago** Chapter.

The Minuteman Missile employs a solid propellant fuel, can be operated on short notice, is of small size, and thus can be readily moved from one area to another. The great potential and advantages of this fuel were demonstrated early in this country's rocket development work, but only in the past four years has any real effort been made to improve high-strength materials for rocket motor cases.

After about two years of organized development, the desired efficiencies have been achieved in the application of materials processing and quality control which have been used in aircraft engine operations. Qualification tests accurately evaluate the physical and mechanical properties of the raw steel and fabrications. Conventional yardsticks of control are used, however, the most important one, which has attracted much attention, is the determination of crack propagation resistance. The Allison Division developed a special instrumented bend test which measures the ability of a rectangular beam, bending under a three point loading system to resist crack propagation, for this purpose.

SAE 4130, AMS 6350 and a medium alloy steel designated "D 6" proved to be suitable materials for rocket motor cases. Test procedures discussed by Mr. Hanink are used as yardsticks for the further development of materials in the continuing metallurgical programs to improve the efficiency of solid propellant rocket motor cases. All of the work was related to the current Minuteman first and second-stage Rocket Motor Case Programs at Allison.

After the lecture a movie entitled "Minuteman Missile and Mission" was shown. It was narrated by Chet Huntley and produced by Thiokol Chemical Co. prime contractor for the first stage, and provides technical know-how for the second-stage rocket. *(Reported by W. L. Meinhart)*

Nondestructive Testing of Steel and Steel Products

Metallurgical experts have in the past looked upon nondestructive testing as one of the tools by which the American steel industry might maintain its lead over foreign competition. Recent reports, however, indicate that as far as the steel industry is concerned, foreign competition may already have moved ahead of this country in its application of nondestructive testing to production, according to W. A. Black, assistant director of research, Republic Steel Corp., Electromechanical Research Center, who spoke at a **Warren** meeting.

One reason for this may be lack of familiarity on the part of metallurgists with the enormous variety of techniques of nondestructive testing now available. This thought is illustrated by the frequency with which authors of metallurgical papers refer to such tests as ultrasonic and eddy current with the implication that the word "ultrasonic" or "eddy current" defines the test. This is so far from the truth, according to Mr. Black, that the words are practically meaningless without additional definition.

To illustrate the procedure by which a nondestructive testing engineer might select a suitable test, he described the advantages and disadvantages of several different nondestructive tests as applied to pipe and tubing, including ultrasonic, magnetic particle, eddy current, penetrant and radiographic. Each has features that make it the correct selection for a certain set of conditions. The capabilities of the tests differ so much that under some conditions, such as for certain reactor components, the use of all the tests appears to be justified.

Mr. Black also described new mill applications of an eddy current instrument for the inspection of metal surfaces. They were concerned primarily with the classification of semifinished steel on the basis of surface-seam depth. *(Reported by Don L. Robinson)*

J. H. Greenberg, chairman, D. K. Hanink, speaker, and George H. Bodeen, technical chairman, shown at a meeting in Chicago

Crystalline Imperfections

Milwaukee Chapter recently sponsored an educational seminar on "Some Crystalline Imperfections and Their Effect on Metal Properties". Four prominent authorities were featured on the one-day program, each discussing a pertinent aspect of the subject.

R. A. Dodd, associate professor at the University of Wisconsin, spoke on "The Present State of Knowledge Regarding Initiation of Fatigue Cracks". Dr. Dodd reviewed many of the current ideas associated with fatigue failure, pointing out that fatigue is a surface phenomenon and fatigue properties therefore depend on the nature of the surface. Four aspects of plastic deformation were suggested as being involved in the nucleation of fatigue cracks; the formation of persistent slip bands, extrusions and intrusions, cross slip and the agglomeration of vacancies. Dr. Dodd pointed out that any theory concerning the basic mechanism of crack nucleation during fatigue must account for:

1. Extrusion and intrusion of metal along slip bands.
2. The temperature-dependency of fatigue hardening and its similarity to irradiation hardening.
3. The mechanism of the formation of dislocation loops observed by transmission electron microscopy.

Robert J. Stokes, principal research scientist, Minneapolis-Honeywell Regulator Co., discussed "Ductile and Brittle Fracture Mechanisms". The relationships between stored elastic energy and surface energy were used to illustrate the calculation of the theoretical strength of solids. Dr. Stokes explained how dislocation concepts and Griffith's theory can be used to account for the discrepancy between the theoretical and experimental strengths of solids. The surface is very important in determining whether a material exhibits ductile or brittle behavior.

Dr. Stokes also discussed recent mechanisms which have been proposed to explain the formation of cracks in polycrystals and single crystals, including those based on the intersection of dislocations, formation of low-angle boundaries and the intersection of twins in single crystals.

Whether or not a crack can propagate determines if the material will exhibit brittle behavior. Inherent defects in the material appear to strongly influence the propagation of cracks. The effect of state of stress on rate of crack propagation was discussed. As a crack approaches a free surface the stress state changes, more energy is absorbed and the rate of crack propagation changes, thus influencing the mode of fracture. The ductile-brittle transition curve can thus be explained on the basis of changes in stress state.

W. R. Heller, research staff member, IBM Research Laboratory, talked on "Crystalline Defects and Creep in Metals". The main facts discussed were the classification of creep behavior into types observed at low, intermediate and high temperatures in relatively pure crystals. The main characteristics and underlying mechanisms for each type were discussed. Dr. Heller also presented an interpretation of strengthening by alloy additions. A new mechanism for the yield point was introduced. Instead of the dislocation being surrounded by a cloud of atoms, as has been proposed by Cottrell, the dislocations may be locked by a coherent precipitate. Such a mechanism could account for blue brittleness and other temperature effects on the mechanical properties since at different temperatures a different precipitate is involved.

A. B. Michael, director of research, Fansteel Metallurgical Corp., described "High-Temperature Oxidation of Refractory Metals". He emphasized the amount of research which has been done on the elevated temperature mechanical and oxidation behavior of tungsten, tantalum, molybdenum and columbium to yield materials which are usable over 1100° C. Oxidation behavior of these metals and the principle of alloying to decrease their rate of oxidation at elevated temperatures was discussed. Dr. Michael related the role of oxide imperfection to the oxidation processes in these metals. Data on the oxidation properties of promising refractory metals was presented. Dr. Michael also discussed the protection of base metals by silicide coatings. The silicide prevents oxidation by blocking the inward diffusion of oxygen. Principles which determine the effectiveness of diffusion barriers for decreasing the rates of oxidation of the substrate metal were also covered. *(Reported by D. W. Hoeppner)*

Reviews Steelmaking Processes

New steelmaking processes were reviewed by Frederick C. Langenberg, manager of applied process research, Crucible Steel Co. of America at **Penn State.**

New steelmaking processes have appeared within the last decade for reasons that are not wholly technological. Political, economic and sociological factors have had a significant influence. Raw material supplies and reserves and the capital costs of new equipment also account to some degree for development of new processes. In the United States, new capacity is no longer the prime motivation for new process development.

Refining methods represent some of the most important advances in steelmaking. The pneumatic processes (Kaldo, L-D, Rotor and Ajax) and recent openhearth developments have increased ingot tonnage in some locations and increased the output of existing facilities.

The Kaldo furnace is a closed-bottom converter geared for tilting and rotating which operates at a 17° angle to the horizontal. Oxygen is injected through a lance (22-30° to the horizontal) which protrudes through the exhaust hood. Its tip is above the slag layer. The Kaldo operation utilizes slag-metal reactions and much of the oxygen input is transferred to the metal through the slag. Because carbon monoxide is burned to carbon dioxide inside the furnace and provides a great deal of heat, up to 45% scrap can be used. Charges containing up to 2% phosphorus can be handled easily; the phosphorus content drops as the carbon content drops. Silicon is almost completely removed. At present, two Kaldo shops are in operation in Europe, and three more will begin operation within 18 months. An installation in the United States should be announced soon. (Since this report was received, Sharon Steel has announced plans to install Kaldo.)

The L-D process was conceived and initially developed in Austria. Oxygen is blown into a non-rotating closed-bottom converter with a vertical lance through the slag layer and directly into the metal. Carbon monoxide is burned to carbon dioxide outside of the furnace with air in approximately a 10:1 ratio, and thus only 25% scrap can be used. Fuel lances may increase this percentage. The L-D process has an approximate oxygen consumption of 1600 cu.ft. per ton of steel and good temperature control; it is suited to the production of many types of alloy steels. The U.S. has the world's largest capacity for L-D steel and Japan is second.

The Rotor process involves a cylindrically shaped furnace which can rotate on its three major axes. It operates with its longitudinal axis parallel to the floor. Two oxygen lances are used; one immersed within the metal, the other positioned above the metal to combust the carbon monoxide. Because of this combustion within the vessel, the roof of the vessel becomes very hot. It is cooled by continuously rotating the furnace about its longitudinal axis at about 2 rpm. In this manner, the roof is cooled by heat exchange with the liquid metal

and some mixing occurs. High scrap charges are possible. The chief disadvantage of the Rotor process is high refractory consumption, and it requires more oxygen per ton of steel than the L-D process.

The Ajax process is carried out in tilting openhearth furnaces at Appleby-Frodingham. Oxygen lances are introduced through the ends of the furnace and are located so that the oxygen is injected at the slag-metal interface; 100% hot metal charge is used and some liquid metal is left in the furnace from the previous heat.

Recent openhearth developments include the use of oxygen, oxygen-fuel lances, limestone and ore injection and the extensive use of basic roofs. Oxygen may be introduced with lances through the roofs or below the end burners to support combustion. Roof lances normally blow about 6 in. above the slag, and 300-700 cu.ft. of oxygen is consumed per ton of steel. Roof lances have increased furnace production in some shops by 35-40% but this may be increased further by use of oxy-fuel lances. Although the use of oxygen has increased the flexibility and production rate of the openhearth, Dr. Langenberg said that probably no new openhearth shops will be built in the United States. New steelmaking processes will gradually replace openhearths, but the openhearth will still be the dominant steelmaking tool for the next five to ten years.

Pretreatment processes are used in Europe. At one shop in Sweden, electric furnace steel is pre-refined in a Bessemer converter. Silicon and manganese are removed in the converter and the carbon content is reduced to about 20 points above that desired. The hot metal is then transferred to an electric furnace in which the refining is completed.

At an installation in Holland, hot pig iron is transferred from submarine ladles to open-top ladles. These are moved to a blowing station equipped with hood, lance and dust cleaning system. Oxygen is injected through the lance into the hot metal. Silicon is practically all removed and the carbon content is decreased to about 2.5%. The pre-refined hot metal is then transported and charged into openhearth furnaces.

The charging of pre-refined metal into electric furnaces has resulted in increased production rates as well as a reduction in power and electrode consumption. In the future, pretreatment of electric furnace steel in an oxygen converter is likely to appear. Such a combination would allow more scrap to be used, decrease production time for highly alloyed steels and give a more flexible control of sulphur and phosphorus. The converter would also produce steel directly.

The usual methods of refining steel are not effective in removing gases to low levels; they are best removed by melting in a vacuum or by melting in air and then exposing the metal to a vacuum. Vacuum induction melting and vacuum arc melting were reviewed and the advantages and disadvantages of each discussed. Vacuum degassing of liquid metal is widely done on a commercial basis. There are many types of vacuum degassing, such as ladle degassing, ladle-to-ladle stream degassing, ladle-to-ingot-mold stream degassing, and variations of these. The disadvantages of ladle degassing are ferrostatic head, mixing and temperature losses. Ladle-to-ladle degassing also suffers from temperature losses; ladle-to-mold degassing is excellent for large ingots.

A unique process of vacuum degassing is used by Crucible Steel Co. A snorkel tube at the bottom of a vacuum chamber is lowered into the ladle which contains molten steel. Because of the pressure difference, metal is forced into the vacuum chamber and degassed there. The chamber is then raised and the metal falls back into the ladle. The cycle is repeated many times until the gaseous impurity content of the steel is decreased to specified values. Carbon heating rods maintain the chamber at proper temperature. Alloy hoppers allow the addition of alloys to the steel under vacuum.

New steel casting methods were discussed, with emphasis on continuous casting and pressure casting. Billets 2 x 2 in. and slabs 48 in. wide and 2 in. thick have been successfully cast in continuous units. Pressure castings are characterized by a near-perfect surface. Railroad car wheels, billets and slabs have been cast successfully by this method. *(Reported by George Sabol)*

IHEA PLANS PROGRAM ON OVENS—*The public relations committee of the Industrial Heating Equipment Assoc. discussed the IHEA Symposium to be held at the National Metal Congress in October. Shown are: W. E. Benninghoff, committee chairman and past president; M. R. Ogle, member Board of Directors; R. E. Fleming, executive vice-president; C. F. Burling, past chairman, public relations committee; Howard Richards, chairman, program committee for the Ovens Div., which is sponsoring the program; and Ike Eisenschmidt, member of the Ovens Div. The program on "The New Role of Ovens in Metal Processing" includes keynote speaker J. W. Cornelius, DeVilbiss Co., and talks on Ovens in Continuous Galvanizing, by Frank Sandborn, Industrial Ovens, Inc., Ovens in Coating Continuous Strip, by A. S. Dawe, J. O. Ross Engineering, in Heat Treating Aluminum, by A. J. Snow, W. S. Rockwell Co., and Ovens in the Foundry, by C. H. Barnett, Foundry Equipment Co.*

Research Methods Outlined

The speakers at **Dayton** Chapter's educational series on "Research Methods", recently completed by 60 persons, were W. P. Koster, Metcut Research Associates; D. M. Douglas, Armco Steel Corp.; T. E. Reichard and A. E. Ray, Monsanto Chemical Co.; H. A. Lipsitt, H. L. Gegel, and J. R. Holland, USAF.

Dr. Koster led off with a discussion on how to save time and money through testing by "Simulation of Service Conditions". He explained methods for simulation of temperature, static and dynamic loading, atmosphere, oxidation, corrosion and erosion, as well as calibration and measurement techniques for these conditions and their effects on the critical properties of interest. Photos of specific test setups for a wide range of simulated service tests illustrated many ingenious techniques for evaluating engineering materials and parts.

The use of statistics in engineering and research was described by Mr. Douglas in his talk, "Are Your Experimental Results Really Different?" The ability to apply statistical methods has become a must for today's engineer or scientist to improve reliability, reduce costs and obtain the maximum information from minimum data. Through a "cookbook" approach, he explained how to make use of frequency distributions, probability paper, analysis of variance, F-ratio test, t-test, null hypothesis, confidence limits, paired comparison tests and correlation and regression analysis.

Mr. Reichard outlined recent expansion in research tools and methods for examination of metals. The modern electron microscope extends the magnification range beyond that of the optical microscope to about the same extent that the optical microscope improved upon the unaided eye. While transmission electron microscopy by means of replicas is the most common technique, recent interest in direct examination of thin metal films produced by microtome, thin tapered wedges, vacuum evaporated films or foils has permitted observation of strains and fatigue effects, dislocations, grain boundaries and even crystal planes having large lattice spacings. Transmission microscopy of foils may allow direct study and even photography of phase transformations, recrystallization, recovery, grain growth, plastic deformation and creep. Surfaces may be profitably examined by reflection electron microscopy.

The electron probe micro-beam analyzer is an exciting development and will be important to metallurgists in quantitative chemical analyses of areas of a polished specimen as small as one micron. The tool makes possible analyses of microphases, precipitates, inclusions, grain boundaries, concentration gradients, diffusion couples and scales. Elements from atomic number 12 (Mg) and up can be detected and measured. Mr. Reichard also mentioned a surprisingly simple device which permits use of an electron microscope to prepare stereo X-ray projection microscope movies.

Dr. Ray presented some useful hints and techniques in "X-Ray Diffraction Techniques for Metals Research". Available X-ray equipment was described; methods for determining phase diagrams, detecting precipitation phenomena, thermal expansion, crystallite size, stress measurements and preferred orientation were then discussed.

Dr. Holland continued the series with "Deformation Textures and Their Determination". Techniques involve use of film methods, stereographic projection, electronic detector diffractometers, a spherical post method, a fiber texture method and a texture data treatment which translates pole density to orientation density. Computer techniques have been developed recently which aid in reducing and replotting X-ray data as a stereographic projection. Plotted data points are connected manually to give a normalized pole figure.

Mr. Gegel described techniques and results of research on "Growth and Properties of Iron Whiskers", which are grown by evaporation and reduction of ferrous halides, and, depending upon temperature and degree of supersaturation, fine or coarse whiskers are obtained. Fine whiskers grow by a single axial screw dislocation mechanism and often possess high tensile strengths and show nearly 5% elastic strain. Coarse whiskers grow by two-dimensional nucleation and show reduced strengths. The field ion emission microscope is used to study whisker tips and with this apparatus, as well as improvement in electron microscope transmission techniques, it is hoped that the role of dislocations on growth and mechanical properties of whiskers can be determined unambiguously.

Dr. Lipsitt presented results of recent basic "Metallurgy Research at the Aeronautical Research Laboratory". During studies on brittle behavior of chromium, large grained polycrystalline wires showed up to 50% ductility in bending. Fractures initiated at grain boundaries and solute segregation at grain boundaries played a significant role in brittle fracture. Single crystals of chromium have shown as much as 82% reduction in area in tensile tests at room temperature. Other fundamental research involved strain aging of pure iron at —70 to —150° C. due to hydrogen and the mechanism of fatigue limits in metals, which is a manifestation of strain aging occurring under alternating stress. It may be the limiting lower stress at which strengthening due to strain aging will balance damage due to crack propagation. *(Reported by E. J. Myers)*

Dayton's educational series on "Research Methods" drew an interested audience of some 60 registrants, part of which is shown absorbed in one of the lectures

EMPLOYMENT SERVICE BUREAU

Operated on a no-charge basis for A.S.M. members in good standing. Ads are limited to 50 words and only one insertion of any one ad. Address answers to: Box No., American Society for Metals, Metals Park, Novelty, Ohio, unless otherwise stated.

POSITIONS OPEN

East

PLANT METALLURGIST: Experience in stainless steel. Good working knowledge of foundry practices and procedures. Excellent opportunity with progressive medium-size organization. Salary commensurate with experience. Metropolitan New York location. Write in complete confidence to Box 8-10.

PHYSICAL METALLURGIST: Excellent opportunity for research in materials for applications to electronics and missiles. Location Washington area. Ph.D., with at least five years experience and recognized research publications, desired. Box 8-15.

Midwest

MECHANICAL METALLURGIST: Large national oil company with research laboratories in Chicago area has openings for research metallurgist interested in mechanical properties of materials. Postgraduate degree, as well as an interest in stress analysis, desirable. For details apply to: A. C. Borg or C. H. Samans, American Oil Co., Research and Development Dept., Whiting, Ind.

CHEMICAL ENGINEER: With metallurgical background, to supervise laboratory for small progressive company melting high alloy and stainless steels. Spectroscopy experience desired. Age 30-35. Ideal living area. Salary commensurate with experience. Box 8-100.

POSITIONS WANTED

METALLURGICAL ENGINEER: M.S. with thorough practical knowledge of high-temperature alloys, steels and nonferrous metals, acquired in over nine years diversified experience in alloy development and materials application, desires responsible position of challenging nature with opportunities for advancement. Age 38. Box 8-20.

METALLURGIST DESIRES ACADEMIC POSITION: M.Met.E. and Ph.D. in metallurgy. Age 27. Some teaching experience, presently employed in research laboratory. Two years military service completed plus other responsible experience. Would like opportunity to teach and do research with progressive institution starting in September 1962. Box 8-25.

SALESMAN: Married, 3 children, veteran, 32 years old. B.A. degree, five years excellent training in ferrous seamless tubing industry. Present position: office manager. Interested in sales representative position with mill or warehouse. Prefer Midwest or Rocky Mountain states. Resume on request. Box 8-30.

METALLURGICAL ENGINEER: Five years experience in research and development work involving refractory alloys, nuclear reactor applications and vacuum induction melting and casting. Has demonstrated supervisory and administrative abilities, desires more responsible and challenging position. Age 30, married, veteran. Prefers South or West. Resume on request. Box 8-35.

MATERIALS SCIENTIST: Non-citizen, M.S. degree, ceramics, Sc.D., physical metallurgy. Experience in teaching materials and research in refractory metals and ceramics, seeks immediate permanent position in teaching or research in physical ceramics and metallurgy. Preferred West or East coast. Box 8-40.

INVESTMENT CASTING

Rapidly growing precision casting firm offers these challenging opportunities for young men with imagination and drive.

CHIEF ENGINEER

Will have complete responsibility for the development of all new production jobs, including tooling, gating, sample runs, etc. Will also be responsible for metallurgical work in Casting and Heat Treating Departments. Degree in metallurgy and foundry gating experience necessary for qualification. Work is related to ferrous, nickel, and cobalt base alloys, both air and vacuum melt.

PRODUCTION SUPERINTENDENT

This position, reporting to the Production Manager, involves the supervision of all production departments. Several years of successful experience in direct production supervision required. Steel foundry experience, and particularly investment casting experience, desired.

Excellent working conditions—profit sharing—opportunity to live in the great Northwest.
Send resume to:

Mr. E. H. Cooley, President
Precision Castparts Corp.
4600 S.E. Harney Drive
Portland 6, Oregon

ATOMIC PERSONNEL, INC.

WRITE FOR APPLICATION OR SEND RESUME

A NATIONAL EMPLOYMENT AGENCY for the NUCLEAR FIELD

CONFIDENTIAL HANDLING

NO CHARGE TO INDIVIDUALS

Suite 1207-J, 1518 Walnut St., Phila. 2, Pa.

TECHNICAL WRITER

★ ★ ★

The Huntington Alloy Products Division of the International Nickel Company needs a graduate engineer with technical writing experience.

The work involves analysis of data and searching literature in the preparation of technical reports, bulletins and advertisements. Writing skill is a definite requirement, and knowledge of metallurgy and corrosion is desirable.

Write, stating qualifications and salary desired to:

W. C. Norton, Manager
TECHNICAL SERVICE
HUNTINGTON ALLOY PRODUCTS DIVISION
THE INTERNATIONAL NICKEL COMPANY, INC.
Huntington 17, West Virginia

All qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

RESEARCH METALLURGIST

To conduct experimental research on the various methods, such as vacuum, levitation and zone melting, of preparing high purity metals and alloys for metallurgical research.

Ultra modern laboratory, equipped with the finest research facilities.

Requires a Ph.D. in metallurgical thermodynamics or a M.S. with experience in metallurgical research.

Scientific Laboratory

of the

FORD MOTOR COMPANY

You are invited to send a complete resume to

Salaried Placement Section
Engineering and Research Staff
P.O. Box 2053, West Dearborn, Michigan

Allied Chemical

RESEARCH METALLURGIST

Immediate career opportunity for a research metallurgist to conduct exploratory studies.

B.S. or advanced degree in metallurgy and 1-5 years experience required.

Modern research facilities located near Finger Lakes and Adirondack recreational areas of New York State. Liberal employee benefits.

Please send detailed résumé, including salary requirements, in confidence to

Central Personnel Department
SOLVAY PROCESS DIVISION
Allied Chemical Corporation
P.O. Box 271
Syracuse 1, New York

PROJECT DEVELOPMENT MANAGER

Graduate metallurgist, experienced with bronze and stainless steel foundry operations, problem solving, metallography, quality control, casting techniques, to administer product development with some customer contact. Company in Chicago area.

Please send résumé, photograph and salary expected.

Box 8-5, Metals Review,
Metals Park,
Novelty, Ohio

WELDING ENGINEER: University graduate, registered professional engineer, 10 years experience in welding metallurgy and design for pressure vessels, cryogenic equipment, atomic reactors, heat exchangers, etc. Research on exotic materials and supervision of all welding processes. Presently in charge of welding, X-ray, heat treating departments and testing laboratory. Qualified to take complete charge of welding engineering and research, and if necessary, to supervise plant production. Desire position offering challenge and scope for advancement. Box 8-45.

METALS DEVELOPMENT: Experienced research, age 34, desires employment in metals development. Four and a half years experience in chemical and physical metallurgy includes production and phase diagrams of reactive nonferrous metals. Experience with induction and arc furnaces and vacuum equipment. Location not important. Box 8-50.

METALLURGICAL ENGINEER: B.S., age 29, married. Variety of experience with high-temperature materials, refractory metals, intermetallics, ceramics and glasses. Research and development work on advanced thermo-electric materials. In charge of mechanical testing and metallographic laboratories. Prefers work in semiconductor or thermo-electric field in Los Angeles or California. Box 8-55.

CHIEF METALLURGIST: Twenty-six years experience in both light and heavy industry. Strong background in metallurgical and chemical control laboratory supervision and management, including active participation in material selection, heat treat processing and welding methods. B.S.Ch.E. Resume on request. Box 8-60.

METALLURGICAL SALES ENGINEER: To cover Chicago area. Engineering degree with 15 years in sales and development of uses for metals, alloys, ceramics, chemicals and refractories in steel and foundry industry. Resume on request. Box 8-65.

METALLURGICAL RESEARCH AND DEVELOPMENT MANAGER: Broad experience with high-temperature alloys, cast iron, steels, aluminum, reactive metals and ceramics. Heavy experience guiding metallurgical research and development plus topnotch engineering work. Knows research and development personnel, program planning, budgeting and execution. Mid-30's, M.S., publications. Box 8-70.

METALLURGIST: Age 37, with 11 years diversified experience in nonprofit research organization and in forging and steel industry in both research and plant operation. Strong research inclination, desires opportunity in ferrous, high-temperature or refractory metals field. Degree in engineering physics, registered professional engineer. Box 8-75.

METALLURGIST: M.S., age 43, with 20 years diversified experience in metallography, heat treatment, welding research, failure analysis and report writing. Background includes production problems, alloy development, gas carburizing and melting. Three years experience in roller bearing industry. Publications. Desires position in research or production where experience can be utilized fully. Box 8-80.

METALLURGICAL ENGINEER: M.Met.E., with ten years operating experience melting sponge iron in all sizes of electric arc furnaces up to 80 tons. Also experienced in production of all classes of electric furnace steels. Resume on request. Box 8-85.

METALLURGIST: Married, age 50. Broad knowledge of properties, processing and application of standard, tool, stainless and specialty steels and nonferrous alloys. Laboratory experience includes inspection and technical services. Experienced in metalworking, brazing, welding, heat treatment and surface finishing. Research in transformation and alloy development. Publications. Box 8-90.

AUSTRALIA
THE UNIVERSITY OF NEW SOUTH WALES
LECTURER
SCHOOL OF METALLURGY

The University of New South Wales wishes to appoint a Lecturer to the staff of the School of Metallurgy.

The successful applicant will work in the fields of physical metallurgy or metal physics, and should preferably have had formal training and post-graduate experience in the physics of the solid state.

Applicants for this position should have an honours degree or equivalent qualifications in metallurgy or physics.

Salary: £A1772 range £A2477 per annum.

Commencing salary is determined by qualifications and experience.

After passing a medical examination, the successful applicant will be eligible to join the State superannuation scheme. He will be eligible, after six years of service, for twelve months study leave on full salary.

The University will pay travel expenses for the appointee and his dependent family and will meet reasonable removal expenses for furniture and effects. With the approval of the University and its bankers, married men may be assisted by loans to purchase a home.

Inquiries about the School of Metallurgy may be addressed to the Head of the School, Professor R. H. Myers.

4 copies of applications including the names of 2 referees should be lodged with the Agent-General for New South Wales, 56-57 Strand, London, W.C. 2, and a copy forwarded by airmail to the Appointments Section, Box 1, Post Office, Kensington, N.S.W.

Challenging Positions
in an expanding
DEPARTMENT OF MATERIALS ENGINEERING

SENIOR RESEARCH METALLURGIST

Interested in alloy development, both ferrous and nonferrous, high temperature testing, and evaluation of materials. Advanced degree or B.S. with 5-10 years experience in similar work.

SENIOR WELDING RESEARCH ENGINEER

Interested in welding process development and welding metallurgy. Field unlimited with respect to materials and processes. Advanced degree or B.S. with 5-10 years experience in welding and fabrication work.

METALLOGRAPHIC TECHNICIAN

With a wide background of practical experience in metallography of ferrous and nonferrous metals. Must be familiar with electrolytic and mechanical polishing techniques. B.S. degree or high school diploma with 5-10 years experience.

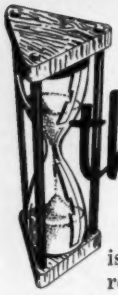
Please send resume to:

R. C. Mays, Director of Personnel

SOUTHWEST RESEARCH INSTITUTE

8500 Culebra Road
San Antonio 6, Texas

All qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.



the 3 minute glass

The "cover man" on this month's issue of *Metals Review* is Dr. Taylor Lyman, editor of ASM Metals Handbook, and recently appointed as editor of all ASM Reference Publications (technical books, manuals, etc.)

I wasn't looking over the shoulder of the photographer when he took the picture of Taylor, but we may well assume that Taylor was reading mail received from readers of the new Volume I of the 8th edition of the Metals Handbook, published earlier this year.

"An author would be less than human", says Taylor, "if he did not look forward to, and find encouragement in, letters of appreciation from his readers. The more than 1300 contributors to Volume I are, I believe, particularly deserving of this kind of recognition for their efforts in providing the technical world with a reference book of which all of us in ASM are justly proud. And, to be sure, many gratifying letters have been received at Metals Park—usually addressed to one of the staff, but intended for each of these worthy contributors".

Taylor has been associated with ASM since 1945, and so reading the mail that comes in as a result of publication of a new edition of the Handbook is not a new experience. He was the editor of the 7th edition which appeared in 1948, has had widespread distribution, and has been augmented by two supplements in the interim.

Reading the mail about the first volume of the current edition reveals such messages as these:

I congratulate all concerned, writes a reader in London, *on this magnificent achievement. There is no other publication in the world like this, and I do not think that there is any other organization in the world which can produce anything comparable in quality as well as in completeness.* And the British, as we all know, are seldom guilty of overstatement.

Many readers have commented specifically in relation to particular sections. For instance, from the president of a company: *The section on tool materials is a remarkable and valuable compilation. This information is much needed, and its availability should be emphasized and its use encouraged.*

Two more samples:

My vocabulary is not extensive enough to let you know how much I appreciate this book and the vast knowledge that is set forth in it. One must own a copy to really appreciate it. My hat is off to the men who compiled all this information.

I have gone through the new Handbook from cover to cover and am so impressed with the magnitude and excellence of the work that I am impelled to write you my commendations. I have spent 40 years collecting data on metals; the ASM Handbook committees have collected in one book, excellent in presentation and usable form, many, many times more information—and better authenticated than has ever been available to ASM members.

And here is an additional important point from Dr. Lyman:

"Of course, in addition to orchids, the history of the Handbook has been assisted through the decades by a steady flow of suggestions from readers, who know that the book is always in the process of revision, that the next edition is coming and can be better than the last. These suggestions, offering recommendations for additional subjects and data to be included in the future, pointing out ambiguities and apparent inconsistencies in the text, or correcting the occasional typographical error, have always received the most thoughtful consideration from the Handbook Committee and staff, and will continue to have their close attention. So keep those cards and letters coming. In this way, it will be possible to make our highly reliable Handbook even better".

Allan Ray Putnam
Managing Director

METALS ENGINEERING QUARTERLY

Metals Engineering Technical Papers ... Now Four Times a Year!

FEBRUARY • MAY
AUGUST • NOVEMBER

The Metals Engineering Quarterly has no counterpart in ASM publications; it offers ASM members the opportunity to obtain practical, useful information on a wide variety of subjects, quickly and at the least cost possible.

This periodical fills a critically felt need. It brings you papers presented at the National Metal Congresses, at regional metal congresses such as the 1961 Western Metal Congress, and at regional programs developed through MEPC throughout the year in various parts of the country.

The Metals Engineering Quarterly is being issued in February, May, August and November of each year. The magazine is 8½ x 11 in size. ASM members may subscribe for only $6.00 per year, and can now build one of the most up-to-date libraries at an extremely small investment.

Please enter your subscription by using the coupon below. You may enclose your check or request to be invoiced at a later date.

American Society for Metals
Metals Park, Novelty, Ohio

Please enter my subscription to the Metals Engineering Quarterly, beginning with the current issue in stock, at $6.00 per year. ($10.00 for non-members) U.S. and Canada only. Please add $2.00 for postage if overseas.

☐ Please invoice my firm.

☐ Enclosed is $.....

Check here ☐ if ASM member.

NAME_____

COMPANY_____

STREET_____ CITY_____

STATE_____

VISIT THE SPECTACULAR 1961 DETROIT METAL SHOW

OCTOBER 23RD TO 27TH • COBO HALL

WORLD'S MOST COMPREHENSIVE MATERIALS AND PROCESSING EVENT

GIGANTIC MATERIALS COMPARISON CENTER

PRESENTATION OF OVER 200 TECHNICAL PAPERS

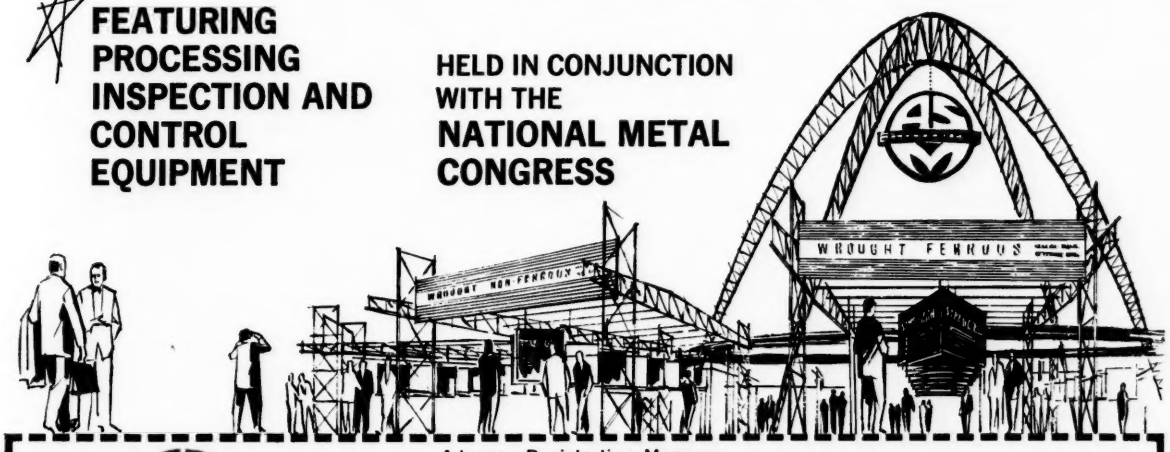
FEATURING PROCESSING INSPECTION AND CONTROL EQUIPMENT

Keyed to the needs of metalworking executives, this engineering capital for 5 days is your opportunity to get hundreds of new ideas . . . see and hear of the most recent developments . . . right from the specialists themselves.

More than 300 educational exhibits and more than 200 technical papers are all available to you for the purpose of broadening and up-dating your knowledge of the gigantic and dynamic metalworking industry.

Cobo Hall provides virtually every convenience for the show visitor. All exhibits, most technical sessions, meetings and banquets are to be held under one roof. Cobo is one of America's newest and finest halls . . . with excellent dining facilities, air conditioning, superb meeting rooms.

HELD IN CONJUNCTION WITH THE NATIONAL METAL CONGRESS



PLAN NOW TO ATTEND THIS GREAT SHOW!

ORGANIZE A COMPANY GROUP FOR TRAVEL AND ACCOMMODATION ECONOMY!

USE THIS CONVENIENT ADVANCE SHOW REGISTRATION FORM! You will receive your ASM INFORMA-Badge, your credit card guest permit to the show.

Advance Registration Manager
ASM Headquarters, Metals Park, Ohio

10396-ASM

Gentlemen: Please register myself (and the names of my associates listed below) for the forthcoming METAL SHOW at Cobo Hall in Detroit.

Name	Title	Indicate Affiliated Organization*	Registration Fee of $2.00 For Non-Members of Affiliated Organizations*

(Enclose check or money order) TOTAL

Company _____

Address _____

City _____ Zone ___ State _____

*No registration fee for ASM Sessions and exposition for members of ASM, AIME, and SNT.

Flying workhorse airlifts 80-foot power tower

Nickel in alloy steels gives 'copter transmissions extra strength for the toughest jobs

This Sikorsky S-58 is carrying a prefabricated tower to a power line construction project near Lynchburg, Virginia. After setting the towers in place, the 'copter saves time and money by helping to string wire from tower to tower.

Again, these flying workhorses prove they can handle the roughest assignments. But pilots don't want superlatives or guarantees. They want to know without doubt that critical parts will do their job. That's one big reason why nickel is alloyed into the S-58's transmission shafts and gears.

Nickel helps steel take the tremendous bending and twisting of a 'copter's drive shaft under powerful shock loads and unusual conditions.

Strength and toughness are only two properties that nickel imparts to alloys. It can help them withstand the intense heat generated by supersonic flight . . . or shrug off the intense cold of liquid helium. It also offers outstanding corrosion resistance.

When you have a metal problem, don't hesitate to call us. Nickel or one of its alloys may provide the answer.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.

INCO NICKEL

NICKEL MAKES ALLOYS PERFORM BETTER LONGER